
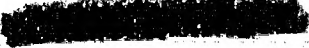

  
Purpose: To do exploratory research upon the relation of component patterns of measurements of physique (body typing) to patterns of personality characteristics (MKULTRA 134).

Initiated: July 1961

Contractor:  as a grantee of the  B

Cost: \$22,000.00

Status: Actual work is expected to commence in September 1961.





134-4

DATE: 29 May 1961

MEMORANDUM FOR : THE CONTROLLER  
ATTENTION : Finance Division  
SUBJECT : MKULRA, Subproject 134

Under the authority granted in the memorandum dated 13 April 1955 from the DSI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 134 has been approved, and \$22,900.00 of the over-all Project MKULRA funds have been obligated to cover the subproject's expenses and should be charged to cost center 2125-1392-1902.

Chief  
TSD/Research Branch

A

APPROVED FOR OBLIGATION OF FUNDS:

Original signed by

Research Director

I CERTIFY THAT FUNDS ARE AVAILABLE  
ORGANIZATION REFERENCE NO: 134  
CHARGE TO ALLOTMENT NO: 2125-1392-1902

AUTHORIZING OFFICER

Date: 12 JUL 1961

Distribution:  
Orig. & 2 - Addressee  
1 - TSD/FASS  
2 - TSD/RB

134-5

12 July 1961

MEMORANDUM FOR: Chief, Finance Division

VIA : TSD/Budget Officer

SUBJECT : MKULTRA, Subproject 134, Invoice No. 1  
Allotment 2125-1390-3902

1. Invoice No. 1 covering the above subproject is attached.  
Payment should be made as follows:

E Cashier's check in the amount of \$22,000.00 drawn on [redacted] payable to the [redacted] B

2. Please forward the check to Chief, TSD/Research Branch through TSD/Budget Officer by 24 July 1961.

3. This is a final invoice. However, since it is anticipated that additional funds will be obligated for this project, the files should not be closed.

[redacted] A  
Chief  
TSD/Research Branch

Attachment:  
Invoice & Certifications

Distribution:  
Orig & 2 - Addressee

CHEQUE 104716 AMOUNT OF \$22,000.00  
RECORDED

[redacted] 14 Aug 61

A

5082







134-6  
C

November 18, 1963

ACCOUNTING OF

Item	Am'ts Carried over from First Year	Allocation for second year	Funds from Other Sources	Total Available	Total Spent	Balance as of 11/15/63
A-Stipend		\$11,400.00		\$11,400.00	\$13,300.00	- \$1,900.00
B-Clerical & Testing Assistance		2,000.00	\$200.00	2,200.00	2,651.00	- 451.00
C-Fees to Subjects		600.00	37.50	637.50	365.50	+ 272.00
D-Cost of Computation	\$ 840.00	1,000.00		1,840.00	1,666.00	+ 174.00
E-Cost of Publication	600.00			600.00	39.76	+ 560.24
F-Travel	292.30	200.00	7.50	499.80	406.90	+ 92.90
G-Office Expenses	214.35	1,200.00	23.35	1,437.70	1,609.32	- 171.62
H-Test Equipment		400.00	22.00	422.00	101.93	+ 320.07
J-Books & Journals	102.89	200.00		302.89	255.15	+ 47.74
K-Contingencies	<u>1,122.96</u>			<u>1,122.96</u>	<u>67.29</u>	+ <u>1,055.67</u>
	\$3,172.50	\$17,000.00	\$290.35	\$20,462.85	\$20,462.85	nil

I certify that services or materials have been satisfactorily received and the expenditures were incurred on official business.

**A**  
Date: Jan 15, 1964



134-7

134

February 1963

Accounting of <sup>C</sup> [redacted] for grant from 9-1-61 to 8-31-62

Received from <sup>B</sup> [redacted] \$22,000.00

Expended:

Salary of Principal Investigator 10,800.00

Clerical and Testing Assit. 1,473.22

Fees to Subjects 1,980.00

Cost of Computation 160.00

Travel 307.70

Office Expenses 1,285.65

Test Equipment 2,425.83

Books and Journals 197.11

Misc. 197.99

Total Expenditures \$18,827.50

Balance to be applied to next year's grant \$ 3,172.50

This is a true statement of accounting as reported to the Fund.

[redacted signature]

Prepared by

[redacted signature] A

examined and approved [redacted signature] submitted

[redacted signature]

Chief TSS/Chemical P

2/25/63

134-8

RECEIPT

Receipt is hereby acknowledged of Treasurer's Check No. 184788,

dated August 11, 1961, drawn on the

[REDACTED] E  
[REDACTED], in the amount of \$22,000.00, payable

to the [REDACTED] B

[REDACTED] C  
Date: August 16, 1961

134-9

12 July 1961

MEMORANDUM FOR: Chief, Finance Division

VIA : TSD/Budget Officer

SUBJECT : MKULTRA, Subproject 134, Invoice No. 1  
Allotment 2125-1390-3902

1. Invoice No. 1 covering the above subproject is attached.  
Payment should be made as follows:

E Cashier's check in the amount of \$22,000.00 drawn on a  
[redacted] payable to the [redacted] B

2. Please forward the check to Chief, TSD/Research Branch  
through TSD/Budget Officer by 24 July 1961.

3. This is a final invoice. However, since it is anticipated  
that additional funds will be obligated for this project, the files  
should not be closed.

A  
[redacted]  
Chief  
TSD/Research Branch

Attachment:  
Invoice & Certifications

Distribution:  
Orig & 2 - Addressee  
1 - TSD/FASS  
2 - TSD/RB

TSD/RB [redacted] A

[redacted]

~~\_\_\_\_\_~~  
INVOICE

For Services

~~\$22,000.00~~

~~\_\_\_\_\_~~ B  
-----  
CERTIFICATIONS

(1) It is hereby certified that this is Invoice ~~\_\_\_\_\_~~ applying to sub-project No. ~~134~~ of MKULTRA, that performance is satisfactory, that services are being accomplished in accordance with mutual agreements, that a detailed agenda of the payments and receipts is on file in TSD/RB, that this bill is just and correct and that payment thereof has not yet been made.

\_\_\_\_\_  
Chief, TSD/Research Branch

Date: \_\_\_\_\_

(2) It is hereby certified that this invoice applies to SubProject ~~134~~ of MKULTRA which was duly approved, and that the project is being carried out in accordance with the memorandum of 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda.

\_\_\_\_\_  
Research Director

Date: \_\_\_\_\_  
  
~~\_\_\_\_\_~~

134-10

DATE: 29 May 1961

MEMORANDUM FOR : THE COMPTROLLER  
ATTENTION : Finance Division  
SUBJECT : MKULTRA, Subproject 114

Under the authority granted in the memorandum dated 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 114 has been approved, and \$22,000.00 of the over-all Project MKULTRA funds have been obligated to cover the subproject's expenses and should be charged to cost center 2125-1390-3922.

Chief  
TSD/Research Branch

APPROVED FOR OBLIGATION  
OF FUNDS:

Research Director

Date:

Distribution:

Orig. & 2 - Addressee

1 - TSD/FASS

2 - TSD/RB

134-11

June 9, 1961

Memorandum to: [redacted] A

Subject: Recommendation for Funding-[redacted], \$22,000.00 C

After considerable deliberation on the [redacted] proposal, its funding is recommended, despite the superficiality of the proposal and the questionable products which have issued from previous research. It is contemplated that Dr. [redacted] Dr. [redacted] and Dr. [redacted] can strengthen the research accomplished through monitorship and close guidance. This is an important area of research and one which we have wanted to start for a long time. We would like to get someone of better stature working in the area, but this appears to be the best we can accomplish at the moment. C

This work fits into our indirect assessment requirement and will contribute to the Wechsler-Bellevue work in which Dr. [redacted] is engaging. C

Its funding is recommended.

[redacted] A

eb  
Enc: 2 (proposal and comments  
by [redacted] C

OB  
O'Brien  
C  
B  
Dear Dr. ██████████ C

In accordance with your request, I am submitting a revised proposal and budget for a study in constitutional psychology. During the one-year period from September 1, 1961 to August 31, 1962, I propose to carry out an extension of the study which I reported to you last month.

The objective of this study is to explore and define the nature and extent of relationships which, on the basis of the pilot study, appear to exist between anthropometric dimensions developed by Sheldon and others and selected psychological dimensions of temperament, perception, learning, intelligence, and personality. These psychological dimensions will be defined largely as they were in the pilot project but with certain changes and additions which will be outlined in this letter.

The "strategy" of this study is to gather a wide range of data, from anthropometric measurements, through cognitive functions to personality dimensions, on a relatively small number of subjects. Broadly stated, the purpose of this strategy is to elucidate and explain the inter-relatedness of human behavior as it is manifested by an individual on several different levels of functioning. I think that constitutional psychology offers some promise as a basis for the integration of observations from biology, psychology, and axiology into a coherent pattern of relationships.

As you know from reading my last report, the analysis of the pilot study is not completed. Nevertheless, the available analysis points out the value of several changes in thinking and procedure:

1. The pilot project was based in part on the assumption that Sheldon's method for classifying human physiques is psychologically meaningful. Future studies should view Sheldon's methods more critically, preferably from a position of thorough familiarity with his methods. ██████████ C

██████████ The timing of this study makes this step essential because I will not be able to rely on the use of pre-somatotyped subjects.



2. The pilot project has indicated that physical dimensions other than somatotype, such as height and head size, apparently correlate with psychological functions. I plan to search the literature for other potentially significant physical dimensions for inclusion in this research. Recent studies by Tuddenham and Vandenberg will be available for this purpose.

3. With regard to the relationship between physique and temperament, the pilot study made an unobtrusive but productive break with Sheldon's thinking. Instead of persisting in Sheldon's view that physique and temperament are two sides of the same coin, I worked with the idea that the differences between the components of physique and components of temperament are significant in their own right. Some of the highest correlations and most provocative findings emerged from this departure. These promising results underline the value of revising and refining the self-administered temperament scale. This summer, I plan to gather more data on this test from somatotyped subjects. Other investigators have been working independently on the task of devising a self-administered rating scale. I expect to be able to use their findings, too.

4. The pilot study sought correlations between WAIS sub-tests and components of physique. Any future study will use Saunders' factorial studies of the Wechsler scales. It is my hope that relationships which were merely suggestive but not statistically significant will be replaced by correlations which are statistically stronger and psychologically more meaningful.

5. Both of the perceptual tasks used in the pilot study showed significant correlations with aspects of physique. This suggests that the field of perception may be an especially fruitful intermediate ground between physique and personality. I intend to use additional perceptual tasks and will give primary consideration to those which have shown evidence of relatedness to personality variables.

6. The results of the pilot project indicate several ways in which the battery of learning tasks could be revised. One task, nonsense-syllable learning, should probably be dropped. A conditioning experiment which uses a pleasant stimulus could, theoretically, lead to quite different relationships with physique. The possibility of finding other simpler and purer learning tasks will be explored.

7. Participants in the pilot project were given three paper-and-pencil personality tests: the MMPI, the Myers-Briggs, and the Rosenzweig Picture Frustration test. (To date, only the MMPI scores have been included in the statistical analysis). At the present time, two other tests are being considered for inclusion in the battery. The Guilford-Zimmermann Temperament Scale appears to be closer in conception to Sheldon's ideas than any other standard test of its kind. Moreover, its dimensions are framed in terms of normally functioning adults, the kind of subjects I intend to use. Forschach's ideas about the psychological meaning

of color, movement, and form responses to inkblots appear to parallel the dimensions of affect, conation, and cognition. Holtzman's version of Forschach's test may be a suitable vehicle for testing these relationships.

8. I intend to collect preliminary data concerning value orientation, vocational specialization, and transcendental and religious experiences. At this stage, these data would be essentially exploratory. My intention is to develop a battery of psychological scales which will provide as broad a cross-sectional view of each subject as is practical.

9. Because this study is primarily concerned with the relationships between somatotype and psychological functions, it is most important to use subjects who represent the full ranges of each of the three somatotype scales. This will be my primary concern in the selection of subjects. I am assured of an adequate supply of subjects from several sources: colleges, service organizations, an opinion polling concern, and a clinical training program. In addition to group-administered tests, I expect to spend the equivalent of a full day in face-to-face testing of each subject. During the six-month period to be devoted to the collection of data, I plan to test at least 100 subjects and possibly as many as 150.

Budget

Stipend.....	\$10,800
Clerical and testing assistance..	1,200
Fees to subjects.....	3,000
Cost of computation.....	1,000
Cost of publication.....	600
Travel.....	600
Office expenses.....	1,500
Somatotyping equipment and other test equipment.....	2,000
Books and journals.....	300
Contingencies.....	1,000
	<u>\$22,000</u>

Approximate Time Schedule

- Sept., Oct., and Nov. 1961: Preparation of test battery and making arrangements for subjects.
- Dec. 1961, Jan. to May 1962: Testing and data collection.
- June to Aug. 1962: Analysis of data and reporting of results.

I hope that this brief revision will facilitate a favorable decision concerning my proposal. I am looking forward

4  
to devoting my full attention to this project as soon as my present contract expires at the end of June. I am pleased that [redacted] has kindly agreed to act as a consultant to me in the various stages of this study.

Thanks again for your consideration and encouragement.

Sincerely,

[redacted]

CC: Dr. [redacted]

C

Comments on [REDACTED] Report

1. The report as it stands is poorly organized. (I presume it is not a final product.) It is hard to get a clear picture of what he has found.
2. [REDACTED]'s sample (as he admits) is far from ideal in size and in its highly selective character.
3. He has more variables (60 to 70) than subjects. A complete correlation matrix would contain some 3,000 coefficients.
4. I wish he had reported some means, etc., as a partial check on the sample. Wechsler inter-r's would be especially helpful.
5. The difference scores and ratio scores are deceptively tricky. Correlations involving them are full of artifact. They cannot be used in factor analysis.
6. Nevertheless, some of the findings are provocative, and more work of this sort should be done. I would recommend a larger number of subjects, better representative of the general population. The data to be analyzed should be "experimentally independent" (e.g., no difference or ratio scores). "Raw" physical measurements as well as somatotypes should be included.
7. [REDACTED] should be consulted. He has done considerable work in somatotypy.

[REDACTED] Ph. D.

134-12

DRAFT: [REDACTED] A  
29 May 1961

MEMORANDUM FOR: THE RECORD

SUBJECT: MKULTRA, Subproject 134

1. The purpose of this subproject is to support the research studies of Mr. [REDACTED] and Mr. [REDACTED] C  
[REDACTED] His proposal, including an estimated budget, and the results of earlier pilot studies which led to the present proposal are attached.

2. The relevance of this study for the Agency, although frankly exploratory in nature, is in its potential contribution to clandestine indirect assessment, i. e., without the subject's awareness. Previous work by Dr. [REDACTED] and his associates, as well as others, has developed some promising but inexact relationships between body type and temperament (personality characteristics). It is from this earlier work that Mr. [REDACTED] will develop his line of research. The departure from earlier thinking which examines component patterns of physiques in relation to component patterns of temperament (see para. 3 of proposal) appears to be a productive approach. Dr. [REDACTED] C  
[REDACTED] has agreed to consult with Mr. [REDACTED] on problems of design and statistical analysis. A by-product of this research will provide Dr. [REDACTED] additional data which will be useful in advancing his own research program (MKULTRA, Subproject 77). C

3. Funding and monitoring of this project will be handled by [REDACTED] in the regular manner. Accounting for the funds expended will follow procedures previously established by the [REDACTED] Permanent equipment required for the project will become the property of the [REDACTED] B

4. The estimated cost of this subproject will be \$22,000.00 for a period of one year. Charges should be made against Allotment No. 2125-1390-3902.

5. Mr. [REDACTED] is neither cleared nor witting of true Sponsor, C

[REDACTED]

nor is there any intent to make him witting. Dr. [redacted] is a [redacted] cleared and witting consultant to the [redacted]

C  
B  
A

[redacted]

Chief, TSD/Research Branch

Distribution:

Original Only

Attached:

Proposal

APPROVED FOR OBLIGATION OF FUNDS

[redacted]

A

Research Director

Date:

10 JUL 1963

[redacted]

  
C  
ORIENTATION:

The contention that psychological functions vary in relation to physical structure is as old as the study of psychology. There has been much interest in the relationships between physique on the one hand and temperament, disease, and psychosis on the other. Some studies have been done of the relationship between physique and intelligence (Naccarati, Sheldon). One investigator (Morris) has attempted to relate value-orientation to physique. Very few studies are known to exist of the relationships between physique and such cognitive functions as perception and learning.

There are several assumptions implicit in this study. The basic one is that an individual engages in any activity in such a way that his behavior is affected to some extent by each aspect of his total being (as well as by the nature of the task, the time-space matrix in which it occurs, and the social meanings which are imputed to it). One's physique is a system which can, for experimental convenience, be conceptualized as a concatenation of several functional or structural sub-systems. Sheldon's method offers one way of conceptually analyzing the human organism. For the purposes of this study, it is assumed that this method is meaningful in terms of certain psychological variables. These variables are affect, conation, and cognition. Sheldon refers to the endomorphic component of physique as a measure of its



tendency to seek and value affective experiences. Similarly, the mesomorphic component is thought to correlate with the urge for conative expression and the ectomorphic component is seen by Sheldon as the index of cognitive awareness. Just as endomorphy, mesomorphy, or ectomorphy cannot exist independently, neither singly nor in pairs, but only in different proportions to each other, it also appears that neither affect, conation, nor cognition can ever be observed without the active presence of each other. The psychological act, no matter how strikingly it may appear to be purely affective, conative, or cognitive, must always incorporate at least minimal quanta of the other two psychological components. The human robot, the mystic, and the dreamer approach the asymptotic extremes of absence of affect, conation, and cognition, respectively.

Different theories of learning have given differential emphases to the roles of man's affective, conative, and cognitive qualities. Theories emphasizing the roles of reward and punishment in learning have tended to minimize intrinsic meaning in the content of the learning and to make effort sub-serve emotional needs. Such theories could be considered primarily affective in their orientation. Pavlovian conditioning is considered a paradigm of "affective" learning. When an explanation of learning emphasizes drill, repetition, or exercise, it tends to reduce both emotion and meaning to subordinate and insignificant roles in their influence on the process. This approach is primarily conative. It is illustrated by Thorndike's Law of Exercise and Guthrie's emphasis on the necessity for contiguity between stimulus and action for learning to take place. The

gestalt-psychological approach, in its emphases on the perceived meaning of the material to be learned and on the role of meaning in the learning process tends to minimize the importance of both feelings and strivings. It therefore proposes a theory of learning which is primarily cognitive. The gestalt laws of organization emphasize the noetic process instead of feelings and strivings.

This sequence of assumptions lies at the basis of the present study:

1. Kant's trichotomous division of psychological man into affective, conative, and cognitive aspects is at least heuristically useful.
2. Sheldon's somatotypes function differentially so that endomorphs seek affective experience, mesomorphs respond more effectively to conative opportunities, and ectomorphs are most sensitive to cognitive patterns.
3. Valid distinctions can be made between learning theories according to the relative importance they ascribe to the affective, conative, and cognitive aspects or organismic behavior.

Building on these assumptions, it follows that if one develops a battery of learning tasks which are sufficiently different from one another as to evoke different levels of affective, conative, and cognitive behavior; and if one administers this battery of tasks to somatyped subjects, the subjects should differ significantly in their ability to learn the different kinds of tasks according to differences in their somatotypes.

#### HYPOTHESES CONCERNING LEARNING:

1. Endomorphy correlates positively with susceptibility to

classical conditioning. Conditioning can be viewed as the passive (non-conative) learning of an intrinsically meaningless (cognitively weak) relationship (e.g., light precedes air-puff to eye) in order to attain a directly physical gratification or avoid a comparable discomfort. Sheldon says endomorphs tend to seek physical comfort. This is one aspect of their tendency to organize their lives along affectively satisfying lives. If he is right, then endomorphs should learn a pain-reinforced CR more easily than either mesomorphs or ectomorphs. For this purpose, eye-blink conditioning was used.

2. Mesomorphy correlates positively with the ability to learn kinaesthetic patterns of behavior. Sheldon's description of the somatotonic temperament (which for him is essentially synonymous with mesomorphy) indicates a pleasure-in-function in a physical sense, regardless of the absence of the possibilities for deriving either cognitive meanings or affective gratification from the activity. He sees the mesomorph as oriented toward skeleto-muscular action for the sheer pleasure of the act itself. If so, then performance on a learning task which emphasizes drill of neuro-muscular responses in which neither fine cognitive discriminations nor affective satisfactions are of moment should correlate positively with mesomorphy. To test this hypothesis, a finger-maze was used.

3. Ectomorphy correlates positively with the ability to learn cognitive patterns and to order experience meaningfully. Sheldon thinks that as ectomorphy increases, there is an increasing reliance on cognition as the major mode of coping with life's

problems. Habit-formation is weak and there is relatively less concern about physical comfort. Knowledge and understanding are more important than either power and achievement (the conative goals) or security and comfort (the affective goals). If this is so, then there should be a positive correlation between ectomorphy and both sensory discriminations and the learning of transferable principles. In order to test this hypothesis, two kinds of tasks were used. One was a series of 60 "memory-for-designs" problems given concurrently with the conditioning trials. The other was a modification of Katona's match-stick experiment. It is expected that (a) ectomorphy will correlate positively with the ability to learn and subsequently recognize geometric figures and (b) with the ability to develop and utilize principles in solving the match-stick problems.

4. Endopenia should correlate positively with the ability to learn new sensorimotor patterns which compete with old ones. The reasoning behind this hypothesis is that while mesomorphy provides the needed sensorimotor skill and ectomorphy provides the freedom from established patterns of response, endomorphy could be expected to work against success on this kind of learning task because no affectively meaningful goal is available. The task to be used for correlation with endopenia is mirror-drawing of a star pattern. This task will be scored both for time and for accuracy. With regard to time, it is hypothesized that ectomorphy will pre-dispose subjects to more rapid performance in mirror-drawing because of freedom from boundedness to established patterns of eye-hand coordination. With regard to accuracy, it is hypothesized that mesomorphy will correlate with

fewer errors (line-crossings) in mirror-drawing because of greater skeleto-muscular control.

5. Mesopenia will correlate positively with unintentional, incidental learning. Mesomorphs are characterized by Sheldon as practical, conative, and intentional in their behavior. If so, then mesomorphy should militate against the passive learning of unintentional, apparently useless material. Moreover, the relative passivity of endomorphy and the hyper-attentionality of ectomorphy should tend to enhance this kind of learning. As a measure of incidental learning, a 50-item multiple choice test was devised from WAIS items. The WAIS was given to all subjects and the test of incidental learning followed the WAIS by about three weeks.

6. Ectopenia will correlate positively with rote learning. If ectomorphs seek meaning in their cognitive experiences, it might be thought that ectopenes would be the most ready to accept and work with material which is designed to be as devoid of meaning as possible. Moreover, if, as Sheldon says, ectomorphs are relatively weak at memorization, then ectopenes might be better at a task of rote memory than other somatotypes. To test this hypothesis, four series of nonsense syllables were used. Each series of eight syllables was learned according to the serial anticipation method.

#### HYPOTHESES CONCERNING PERCEPTUAL FUNCTIONS:

Proficiency on the Embedded-Figures Test (Witkin's Form) has been shown to correlate significantly with field-independence, which, according to Witkin et al., is more common in active people who manifest high self-esteem and considerable

awareness of their own motives. According to Sheldon, activity correlates with mesomorphy and self-awareness correlates with ectomorphy. Endomorphs, being naturally less active and more extraverted affectively, would supposedly be more field-dependent. It is therefore hypothesized that proficiency on the embedded-figures test will correlate negatively with endomorphy.

People differ in the extent to which they are subject to optical illusions. Conceivably, differences in somatotype might cast some light on the nature of the perceptual difference. Ectomorphy is thought by Sheldon to enhance attentionality and cognitive vigilance. It makes for inhibitions of judgment and the exercise of care in arriving at decisions. This attitude should work against the effect of an optical illusion. The more spontaneous responses of the ectopene should therefore tend to accept the illusion. It was therefore hypothesized that susceptibility to the Muller-Lyer Illusion will correlate negatively with ectomorphy.

#### HYPOTHESES CONCERNING THE RELATIONSHIPS BETWEEN PHYSIQUE AND TEMPERAMENT:

Sheldon's findings concerning the relationships between physique and temperament have been criticized on the grounds that the same person (Sheldon) rated his subjects for both somatotype and temperament. Since the publication of his original study, there have been no reports of attempts to either replicate or disprove his findings. This present study includes an initial attempt to devise an "objective" self-rating scale which obviates this important objection to Sheldon's method. A self-rating scale of 178 items was prepared from Sheldon's descriptions of



viscerotonia, somatotonia, and cerebrotonia. It is hypothesized that the following relations will be found:

1. Endomorphy correlates significantly with viscerotonia but with neither somatotonia nor cerebrotonia.
2. Mesomorphy correlates significantly with somatotonia but with neither viscerotonia nor cerebrotonia.
3. Ectomorphy correlates significantly with cerebrotonia but with neither viscerotonia nor somatotonia.

#### HYPOTHESES CONCERNING PHYSIQUE AND INTELLIGENCE:

Both Naccarati and Sheldon have done studies that demonstrated low positive correlations between IQ and linearity of physique. This finding in itself is of limited interest. Since the time when these studies were done, much work has been done on the meaning of sub-test profiles with the hope of developing profile patterns which correlate with aspects of personality. With varying degrees of systematization, psychologists cling to the notion that the specific variances of sub-test scores on such tests as the WAIS provide information about personality. Working on this assumption, if significant correlations can be shown to exist between WAIS sub-tests and somatotype components and between WAIS sub-tests and temperament self-ratings, one should be able to make some deductions about the value of the WAIS for the description of personality.

We are therefore hypothesizing that:

1. Ectomorphy correlates positively with IQ.
2. Each of the ten WAIS sub-tests correlates significantly with one or more of the six measures of physique: endomorphy, mesomorphy, ectomorphy, endopenia, mesopenia,



and ectopenia.

3. Each of the ten WAIS sub-tests correlates significantly with one or more of the six measures of temperament: viscerotonia, somatotonia, cerebrotonia, visceropenia, somatopenia, and cerebropenia.
4. Every significant correlation between a WAIS sub-test and a somatotype rating is matched by a significant correlation between that WAIS sub-test and the parallel aspect of temperament.

SAMPLE:

Fifty adult male Protestant theological students and ministers were used as subjects. They were all photographed and somatotyped by Sheldon or his assistants. They constituted a fairly homogeneous group in that all are college graduates, all have had some exposure to clinical pastoral training as a part of their education for the ministry, and all are of Northern European stock.

We would have preferred to have chosen our subjects on the basis of somatotype, but because this was not practical, we had to work with a sample which was unselected according to this criterion. In his "Atlas of Men", Sheldon gives the means and standard deviations for each component, based on a sample of 12,000 subjects, as follows:

	$M$	$\sigma$
Endomorphy	3.34	1.10
Mesomorphy	4.11	1.03
Ectomorphy	3.42	1.18

For the 46 subjects from whom are obtained enough test data to include in our statistical analysis, the comparable figures are:

	<u>M</u>	<u>C</u>
Endomorphy	4.00	1.27
Mesomorphy	4.17	0.60
Ectomorphy	3.22	1.19

A comparison of these tables shows that our range of mesomorphy is much narrower than Sheldon's norms and that our subjects rank substantially higher in endomorphy. The former shortcoming will make it difficult for us to accept or reject hypotheses involving the influence of mesomorphy unless the relevant correlations meet rigid tests of statistical significance.

#### EXPERIMENTAL TEST BATTERY:

Each subject was given a number of tests which included:

1. Somatotyping.
2. "The Boston Scale for Temperament", a self-rating scale based on Sheldon's "Varieties of Temperament".
3. Two trials on the Miller-Lyer Illusion in a small, hand-size version.
4. Witkin's form of Gottschaldt's embedded-figures test.
5. A full WAIS except for the Vocabulary sub-test. The Educational Testing Service experimental version was used but was scored in the standard way.
6. Eight runs on a finger-maze, scored for time, number of blind alleys entered and number of directional reversals. This task was presented in two sessions of four trials each.

7. Four series of eight nonsense syllables each, presented on a memory drum, scored for number of trials up to but not including two consecutive correct trials. This task was presented in two sessions of two series each.
8. Sixteen mirror drawings of a star, scored for both time and line-crossings. This task was presented in two sessions of eight trials each.
9. An especially prepared version of the Katona match-stick experiment which employed ten trials on four different problems, scored for time and number of successes.
10. A measure of incidental learning based on the WAIS, scored for number of correct answers.
11. An eye-blink conditioning experiment, scored for amplitude of responses on a scale of 0 - 5 from which an index of conditioning was derived by dividing mean amplitude of response to test trials by mean amplitude of response to acquisition trials. The standard deviation of each subject's response amplitudes to all acquisition trials was computed as an index of variability of response.
12. A "memory-for-designs" task was developed primarily to enhance attentiveness and cooperation during the eye-blink conditioning procedure. It is scored for number of correct responses.

#### TREATMENT OF DATA:

1. Product-moment correlations are the primary tools for the analysis of data. The matrix of inter-correlations will be used for computing appropriate multiple and partial correlations

and for factor analysis.

2. Special indices have been computed from the somatotype ratings for endopenia, mesopenia, and ectopenia because of their theoretical significance in Sheldon's system.

3. Similar indices have been computed for the temperamental components derived from "The Boston Scale for Temperament".

4. Difference-scores will be computed between:

- a. Sum of somatotype components less sum of temperament components: E - ET
- b. Visceropenia: E-V
- c. Somatopenia: M-S
- d. Cerebropenia: X-C
- e. Cerebrosis: Xp-Cp
- f. Viscerosis: Ep-Vp
- g. Somatorosis: Mp-Sp

These difference-scores were prepared because it is anticipated that for some cognitive functions, the differences between physique and temperament may be predictive of functions. The derivations and meanings of these scores are explained in the glossary.

Other data were collected on our subjects without specific hypothesis as to how they would correlated with the measures around which the study was planned. They have been included in the correlation matrix and the factor analysis:

1. Head lengths.
2. Head widths.
3. Sheldon's "andric" ratings.
4. Sheldon's "gynic" ratings.
5. Thirteen MMPI scores: L, F, K, H<sub>p</sub>, D, Hy, Pd, Mf, Pa, Pt, Sc, Ma, Si.

Standards of Levels of significance of coefficients of correlation:

When  $N = 46$ , the standard error of a coefficient of correlation is  $\pm .149$  if the population correlation is assumed to be zero. Therefore, coefficients of correlation within this range will be considered to be of insignificant magnitude. The following table will be used for gauging the approximate level of significance of the coefficients of correlation:

Level of significance:	.10	.05	.02	.01	.005
Correlation coefficient:	.246	.292	.347	.384	.419

The problem of curvilinear relationships:

The present method of analysis does not deal with the possibility that curvilinear relationships may exist between some of our dimensions. It is only in the use of scores for time that we have made an effort to avoid curvilinear functions. In those cases such as the time for performance in the embedded-figures test, the finger-maze, the mirror-drawing, etc., the total time taken by each subject was converted to its logarithm for correlational purposes.

With only 46 cases, we felt that it was futile to attempt to estimate either graphically or statistically the presence of curvilinearity in the thousands of relationships included in this study. This study should therefore be evaluated with the understanding that there may be many "false negatives" in our results.

U

Possible Outcomes of This Study

1. This study may cast light on the feasibility of replicating Sheldon's correlations between physique and temperament. By comparing Sheldon's concepts with a variety of other psychological functions, patterns of order and interdependence may arise so that differences between individuals in learning and perceptual functions may be clarified. On the other hand, information as to how to sharpen Sheldon's concepts may grow out of an application of the data in the opposite direction. It may be possible to devise cognitive tests of temperament which are difficult to falsify because they lack face validity.

2. This study may help to extend constitutional psychology beyond medical-psychiatric purlieus and to plant it more stably within the realm of psychology proper. Constitutional psychology may offer some promise for defining the ranges of normal psychological functions. It could conceivably contribute to a pluralistic psychology of individual differences.

3. If this study succeeds in elucidating some of the interrelationships between structure, cognition, and personality, it will provide experimental support for the doctrine of holism and may also provide a new conceptual approach for further studies. If it can be demonstrated that significant portions of the variances of a variety of psychological functions can be accounted for in terms of structural differences, a more stable basis for psychological system-building may be achieved. To this extent, the problem of explanation would be shunted to the biological, and presumably more controllable level of existence.

Figure 1

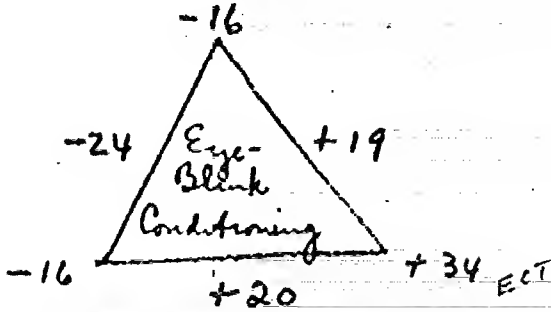


Figure 2

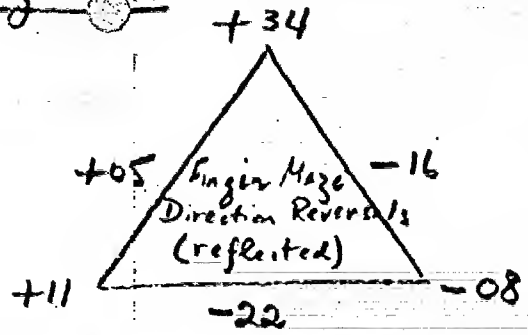


Figure 3

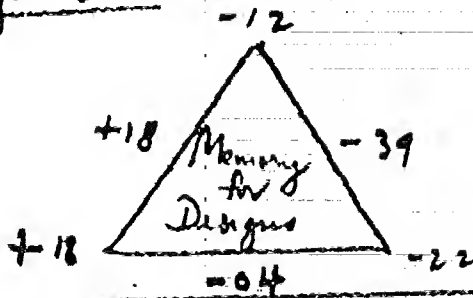


Figure 4

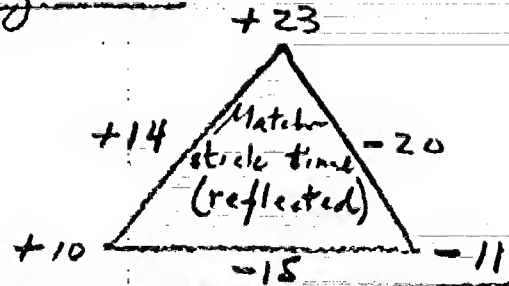


Figure 5

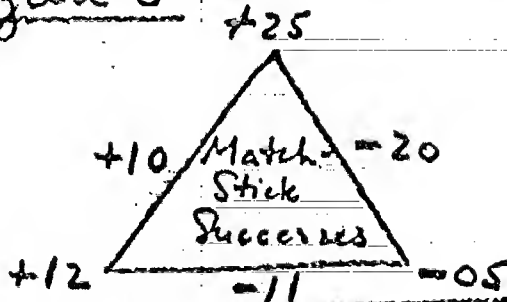


Figure 6

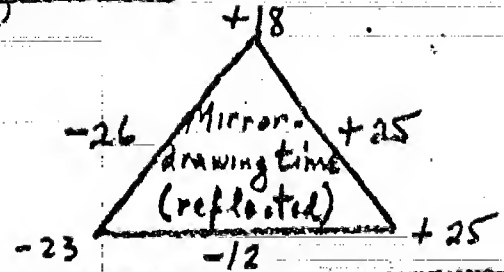


Figure 7

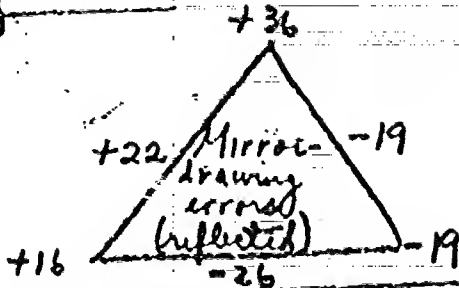


Figure 8

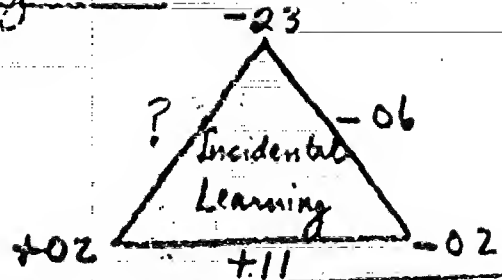


Figure 9

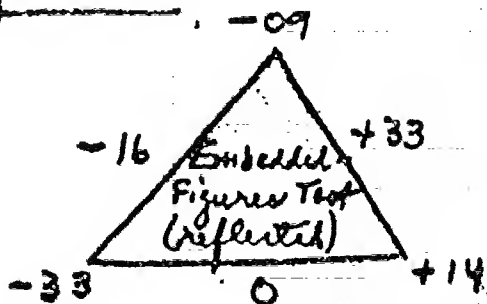
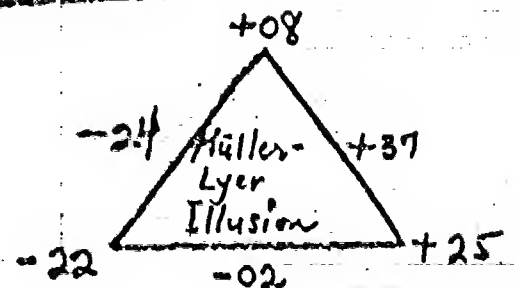


Figure 10





## RESULTS:

1. The experiment clearly rejects the hypothesis that endomorphy correlates with eye-blink conditioning (see Figure 1). Instead, it shows that eye-blink conditioning correlates at better than the .05 level with ectomorphy, and negatively with both endomorphy and mesomorphy. The reason for the failure of the experiment to support the hypothesis may be because we did not distinguish between the adient and abient tendencies ascribed to endomorphy and ectomorphy. In choosing a conditioning experiment which measured abient behavior (blinking in order to avoid an uncomfortable puff of air) as the index of conditioning, we have apparently created a situation in which the ectomorph's tendency to withdrawal was evoked. On the other hand, the results suggest two things:

- a. Sheldon's claim that ectomorphs tolerate, even seek uncomfortable situations, cramped postures, and the like seems dubious.
- b. The question arises as to whether endomorphs might condition more readily than ectomorphs when the CS is a pleasure-evoking one instead of a discomforting one.

In any event, the results indicate clearly that ease of eye-blink conditioning correlates significantly (+.34) with Sheldon's measure of ectomorphy and with self-ratings for the temperamental trait of cerebrotonia (+.33). This is further supported by an  $r$  of +.25 with the social introversion scale of the MPI, which correlates +.50 with cerebrotonia. Other correlations of eye-blink conditioning which attain the .05 level or better are:

- a. -.41 with age
- b. +.31 with cephalic index

c.  $-.29$  with visceropenia (the difference between endomorphy and viscerotonia)

d.  $+.40$  with the  $Mf$  scale of the MMPI

In summary, the particular kind of CR evoked by this experimental setup is associated with ectomorphy, introversion, youth, round-headedness, a feminoid score on the MMPI, and a tendency toward asceticism.

2. According to the second hypothesis, mesomorphy was expected to correlate with performance on the finger maze. Two of the three measures of performance (time and number of blind alleys entered) were uncorrelated with mesomorphy; but the third, number of direction reversals, was found to decrease significantly as the mesomorphy of our subjects increased ( $r = -.34$ ) (see Figure 2). A partial  $r$  ruling out the effect of FSIQ brings this up to  $+.38$ , nearly significant at the  $.01$  level. Moreover, correlations with endomorphy and ectomorphy were nil ( $+.11$  and  $+.08$ , respectively).

In performing a finger-maze task, freedom from direction reversals correlates positively with mesomorphy. It also correlates positively with two WAIS sub-tests, Arithmetic ( $+.33$ ) and Object Assembly ( $+.34$ ). It correlates  $+.44$  with full-scale IQ and  $+.37$  with performance on the embedded-figures test. It also correlates positively with two measures of learning:

- a. freedom from line-crossings on mirror drawings:  $+.47$
- b. proficiency at incidental learning:  $+.35$

Significant correlations are found with four of the MMPI scales:

- a.  $K1$   $-.29$
- b.  $Hs$   $-.36$
- c.  $Pa$   $-.35$
- d.  $Si$   $+.34$

One suggestive finding is that as the score for viscerosis (the difference between endopenia and visceropenia) grows, the frequency of direction-reversals increases. The correlation is  $+0.30$ , which is significant at the  $.05$  level. This is one of the several indications from this experiment that to some extent greater than chance, there are cognitive functions which depend in part on the relationship between one's physique and one's temperament. Findings of this sort appear to be especially relevant for the development of a useful holistic psychology.

Our present scores for combinations of dimensions (such as viscerosis) suffer from a weakness which will be corrected for subsequent analyses of the data. Because they are either ratios or differences of ratios, they tend to exaggerate differences on one side of their mid-points and to minimize differences on the other side. This flaw has been corrected for a re-analysis.

3. Two hypotheses were made concerning the kinds of tasks which would correlate with ectomorphy. In neither case, Memory-for-Designs and the Katona Match-Stick Problems, were the hypotheses supported.

Memory-for-Designs correlated  $-0.22$  with ectomorphy and  $+0.18$  with endomorphy. The fact that data from only 37 cases were available suggests that with more data, multiple correlations for MPD between endomorphy and ectomorphy might well reach a satisfactory level of statistical significance (see Figure 3). But of more immediate interest is the  $-0.39$  correlation of endopenia. This is significant at the  $.01$  level and strongly suggests

that performance on this task does vary with physique but in a manner not anticipated by our theory.

MFD performance also correlates positively with rote memory for nonsense syllables (+.41) and with all three finger maze scores (BA: +.40; DR: +.23; Time: +.47).

It was hypothesized that proficiency in the Katona Match-Stick Problem would correlate with ectomorphy. The experimental results clearly refute the hypothesis both with regard to speed and accuracy of performance. Although none of the three standard components of physique correlated significantly with either performance score on this task, mesomorphy holds a clear edge both for speed and accuracy (+.23 and +.25). Sheldon's "andric" score, a measure of masculinity of physique (the details of which have not been published yet), correlates +.28 and +.29 with speed and accuracy, respectively. The latter figure is significant at the .05 level.

A study of the statistically significant correlations between this task and the other dimensions included in this study evokes some alternate hypotheses. Because success at the match-stick problems correlates with mesomorphic (+.25), andric (+.29), and somatotonic (+.33) traits, it seems reasonable to hypothesize that this kind of learning is a specialty of aggressively masculine men. But this interpretation is complicated by the observation that the endomorph who suppresses his security-seeking viscerotonic needs in favor of a more ascetic orientation seems to do well on the match-stick problems (+.31). Conversely, it is the endopene who describes himself as the self-indulgent viscerotonic who does most poorly with this task (-.50).

Here again is evidence to suggest that Sheldon's physical and temperamental conceptualizations may serve a more dynamic role in supporting the substructure of cognitive functions than Sheldon himself imagined. Our very failure to replicate Sheldon's high correlations between physique and temperament may be the clue to even more interesting relationships.

Success on this task correlates positively with Verbal IQ (+.33), Full-scale IQ (+.33), Dionysian temperament (+.33), and the sum of andric and gynec scores (+.31). It correlates negatively with the Christian temperament (-.31), the ratio of viscerotonia to somatotonia (-.35), and the K scale of the MMPI (-.29).

Quick performance on the match-stick problems correlates positively with WAIS Similarities (+.31), Verbal IQ (+.30), Full-scale IQ (+.34). It correlates negatively with the index for viscerosis (-.42).

4. Note learning of nonsense syllables is the only cognitive task which did not show any correlations of note with Sheldon's components of physique. Nor, for that matter, did it correlate with self-ratings of temperament. Through chance, there happens to be a smidgeon of information which prevents this skirmish from being a total defeat for constitutional psychology. Proficiency at the learning of nonsense syllables does correlate negatively at better than the .05 level with a secondary measure of physique, Sheldon's recently developed "gynec", or feminoid score. There are also three positive correlations to be gleaned from the intercorrelation matrix:

- a. Speed on the finger maze: +.30
- b. Memory-for-Designs: +.41
- c. The Pd scale of the MMPI: +.33

Our original hypothesis that rote learning would correlate with ectopenia must be rejected. Because there is no significant difference between the performances of ectomorphs and ectopenes on this task, Sheldon's statement that ectomorphs are poor at rote learning is cast into doubt.

This task's correlation with Memory-for-Designs was +.41. This is not surprising in that both tasks involve rote learning of material which is presented visually and rehearsed verbally.

An observation about the performance of our subjects on this task may subsequently prove to be of interest within the larger picture. Proficiency on this task seems to decrease with age. The fact that our correlation was only  $-.27$ , hence not significant at the  $.05$  level, may be due to our relatively narrow age range, from 22 to 39. The mean age is 28.2 and the standard deviation is 5.4. This is obviously skewed toward the side of youth. Had we used more older subjects, or had our distribution of ages been more nearly Gaussian, the evidence for a negative effect of age on rote learning ability might have been substantiated statistically.

5. In the case of Mirror Drawing, both hypotheses receive qualified support from the data. Ectomorphy correlates  $+ .25$  with speed of performance (see Figure 6) while ectopenia correlates  $-.26$  with that dimension. However, the differences

in the correlation of speed along the ectomorphy-ectopenia dimension and along the endomorphy-endopenia dimension are so slight that the question as to which of these two dimensions is the better predictor of speed of mirror-drawing is left open. Moreover, the fact that the three indices of physique which are positively correlated with speed all suppress endomorphy, and the three which are negatively correlated with speed include endomorphy tend to indicate that a more intensive study with a wider range of somatypes and more subjects might indicate that the endomorphy-endopenia dimension is the best somatype indicator of speed or mirror-drawing.

A similar situation obtains with regard to the accuracy score for mirror-drawing (see Figure 7). Our hypothesis that accuracy should correlate with mesomorphy is supported (+.36). It is enhanced by the fact that mesopenia shows the highest negative correlation with accuracy (-.26). (These findings are especially interesting in view of the narrow range of mesomorphy in our sample. It does not seem unreasonable to expect that from a sample which represents an average distribution of mesomorphy, substantially larger correlations might be obtained).

But again, when we compare those indices of physique which correlate positively with accuracy with those which correlate negatively, we find that with more data, it might have been demonstrated that the ectomorphy-ectopenia dimension is a better predictor of mirror-drawing accuracy than the mesomorphy-mesopenia dimension. In either event, the present study indicates clearly that performance on mirror-drawing, both in terms of speed and accuracy, correlates significantly with somatype.



If one were to follow Sheldon's thinking, one might expect that if a score on a cognitive task correlates with a component of physique, it could be expected to correlate in the same direction with the corresponding aspect of temperament. It has already been shown that this is not necessarily the case. The scale for mirror-drawing accuracy is a striking instance of a negation of the above supposition. Accuracy correlates positively with mesomorphy but negatively with somatonia, its temperamental counterpart. (In this study mesomorphy and somatonia were essentially uncorrelated [ $+0.04$ ]). In fact, accuracy correlates  $+0.47$  with the difference between mesomorphy and somatonia! This finding seems quite plausible when translated into ordinary language: As a person's physical potential for assertive, aggressive action increases and as his self-rating for his behavior becomes more passive and compliant, then his tendency to perform carefully and accurately on an unfamiliar and rather tricky learning task will increase.

We feel that this statistically unimpeachable finding is one of the most provocative results of the present study. Like the various studies of the relationships between perception and personality done in the past twenty years, it provides a clue as to how to map the nexns of inter-relationships between the various functions of the organism. But it goes one step farther than previous studies in that it correlates a stable physical measure with both a cognitive and a personality measure. In so doing, it points to how we may broaden the base of psychological theory - and possibly stabilize this base by rooting it in a biological foundation.

The time dimension on mirror-drawing did not correlate at the .05 level with any other measure in this study. However the accuracy dimension attained significant levels of correlation with several other dimensions. Those not mentioned in the previous discussion are:

- a. The avoidance of blind alleys on the finger maze (+.38).
- b. The avoidance of direction reversals on the finger maze (+.47).
- c. The greater the difference between the sum of the somatotype components and the sum of the temperament self-ratings, the fewer the line-crossings (+.35).
- d. The greater the difference between endomorphy and viscerotonia, the fewer the line-crossings (+.31).
- e. The greater the difference between ectopenia and cerebropenia, the fewer the line-crossings (+.34).
- f. The greater the difference between mesopenia and somatopenia, the more frequent the line-crossings (-.35).

(This is little more than a re-statement of the relationship between accuracy and the difference between mesomorphy and somatotonia).

6. We must reject the hypothesis that proficiency at incidental learning correlates with mesopenia (see Figure 8). The correlation is only +.11 but it is the highest positive correlation between a somatotype rating and this learning task. Moreover, incidental learning correlates -.23 with mesomorphy. The multiple correlation is +.28, still too low to satisfy the 5% standard of significance. A more careful study of this relationship may yet either support the original hypothesis or strongly

indicate an alternative but related one, viz., that incidental learning correlates negatively with mesomorphy. The present test of the hypothesis is limited by the constricted range of mesomorphy in our sample, the difficulties entailed in procuring scores for incidental learning under standardized conditions, and the deficiency of our present scale of mesopenia. This last weakness is the easiest to improve. This will be done for the final report of our findings.

The only significant correlations of incidental learning were with finger-maze speed (+.46), freedom from direction reversals on the finger-maze (+.35), and the MF scale of the MMPI (+.32).

7. The hypothesis that the embedded-figures test would correlate with endopenia is not only decisively rejected but reversed by our data. EFT correlates negatively with endopenia (-.33) and positively with endomorphy (+.33) (see Figure 9). A similar but weaker relationship is found between EFT and self-ratings for temperament. EFT correlates to a significant degree with head size (+.34), three WAIS sub-tests (DI: +.34; FC: +.41; BD: +.29), all three finger-maze scores (BA: +.33; DR: +.37; Time: +.37), FSIQ (+.36), and the Pa scale of the MMPI (-.34). Performance on this particular perceptual task is obviously strongly related to physical, cognitive, and personality measures. Despite the unquestionable failure of our hypothesis, the data indicate that this measure should be an especially useful tool for further study of the inter-relationships between structure and function.

Since the work of Witkin et al., it has been known that men consistently out-perform women on this task. No satisfactory explanation of this difference has yet been proposed. Our crude measure of head size (length plus width) correlates at better than the .05 level with proficiency at this task. We also know that men's heads have about 7% more cranial capacity than women's. It may therefore be hypothesized that either head size or some other physical attribute closely related to it (cranial capacity, inter-pupillary distance, etc.) may account for much of the sex variance on this task.

8. Although the data do not unequivocally support our hypothesis that resistance to the Miller-Lyer Illusion correlates with ectomorphy, they do indicate a significant relationship between somatotype and susceptibility to the illusion (see Figure 10). The dimension of physique which best predicts our subjects' responses to this test is endomorphy-endopenia. But there is so little difference between the correlations between these poles (-.22 and +.37) and those found between ectomorphy and ectopenia (+.25 and -.24) that it behooves us to suspend judgment until a more careful study is done using more subjects and a better apparatus. In the meanwhile, it is of interest to note that the dimension of temperament self-ratings which best predicts response to this task is cerebrotonia-cerebropenia (+.41 and -.28), or the analogue of ectomorphy-ectopenia. In this case, the difference is significant at better than the .01 level.

For our subjects, resistance to the Miller-Lyer Illusion correlates negatively with age (-.31), negatively with the ratio of viscerotonia to cerebrotonia (-.31) and with two MMPI scales

(L:  $-.38$ ; K:  $-.32$ ). It correlates positively with two other MMPI scales (Mf:  $+0.36$ ; Si:  $+0.38$ ) and with endopenia ( $+0.37$ ).

#### HYPOTHESES CONCERNING PHYSIQUE AND TEMPERAMENT:

	Endomorphy	Mesomorphy	Ectomorphy
Viscerotonia	$+0.56$	$-.38$	$-.39$
Somatotonia	$+0.05$	$+0.04$	$+0.04$
Cerebrotonia	$-.33$	$+0.04$	$+0.28$

Our first hypothesis is supported by the data; endomorphy correlates with self-ratings from viscerotonia at far better than the .01 level and it correlates negatively with the other two somatotype components at the .01 level.

In the case of the second hypothesis, our data indicate no correlations at all! We think that this negative result is not due to the lack of relationship between mesomorphy and somatonia, but rather to three possible factors:

1. The narrow range of mesomorphy in our sample.
2. The crudity of our preliminary attempts to develop a scale for somatonia.
3. The special nature of our sample which, being composed entirely of ministers and theological students, may be expected to have more conflict and confusion concerning the aggressive aspect of temperament than concerning the other two aspects.

The data also reject the hypothesized relationships between cerebrotonia and physique. Cerebrotonia's correlation with ectomorphy falls just below the .05 level of significance. But its correlation with mesomorphy is nil and with endomorphy is significantly negative.

In summary, out of nine inter-correlations, seven fit our hypotheses, one clearly rejects it (mesomorphy-somatotonia), and one is equivocal (ectomorphy-cerebrotonia). But this last item does attain a significant level when the effect of height is partialled out of ectomorphy. This raises the  $r$  to  $+0.33$  and suggests that Sheldon's present method for rating ectomorphy may tend to alienate it from cerebrotonia by being too closely tied to the aspect of height. (The correlation between ectomorphy and height is  $+0.77$ ).

In view of the shortcomings of our sample and the acknowledged deficiencies of our preliminary instrument for measuring temperament, we believe that the present results are good enough to justify a more intensive study with a refined instrument on a more representative population.

Subjects who rate themselves as high in viscerotonia tend to be scored high by Sheldon on the gynec scale ( $+0.37$ ). They do relatively poorly at C ( $-0.29$ ) and DS ( $-0.30$ ) on the WAIS. On the MMPI, they score high on Ma ( $+0.34$ ) and low on Hs ( $-0.30$ ).

Subjects who rate themselves as high in somatonia make more errors on the mirror-drawing test ( $+0.30$ ) but score more successes on the match-stick problems ( $+0.32$ ).

Subjects who rate themselves as high in cerebrotonia tend to be the younger ones ( $+0.61$ ). They resist the Miller-Lyer Illusion ( $+0.41$ ). They do well on the PA sub-test of the WAIS ( $+0.36$ ). They condition readily to the eye-blink procedure ( $+0.33$ ). On the MMPI, cerebrotonia correlates positively with the D ( $+0.46$ ) and the Si ( $+0.50$ ) scales, but negatively with the K ( $-0.34$ ), Hs ( $-0.38$ ), and Hy ( $-0.41$ ) scales.

### HYPOTHESES CONCERNING PHYSIQUE AND INTELLIGENCE:

The WAIS Full-Scale IQ correlates  $-.02$  with endomorphy,  $0.0$  with mesomorphy, and  $+0.22$  with ectomorphy. Although these results do not attain the minimal standard for statistical significance, they agree with the previously reported findings of both Maccarati and Sheldon. It might therefore seem reasonable to conclude that when intelligence is considered globally, a small but stable correlation obtains between it and an index of the linearity and/or asthenia and/or thin-ness of physique. But Sheldon's present method of rating this aspect of physique, which he calls ectomorphy, correlates with FSIQ essentially because of its common variance with height ( $+0.77$ ), which, in itself, correlates  $+0.31$  with FSIQ.

The partial  $r$  between ectomorphy and IQ with height held constant =  $-.03$ .

The partial  $r$  between height and IQ with ectomorphy held constant =  $+0.22$ .

Therefore height, the simpler measure, accounts more parsimoniously for the increment in IQ which is associated with ectomorphy in our data.

Full-scale IQ correlates at the  $.05$  level or better with performance on only three of our perceptual and learning tasks.

These are:

1. EFT:  $+0.36$
2. Finger-maze blind-alley avoidance:  $+0.33$
3. Finger-maze direction-reversal avoidance:  $+0.44$
4. Finger-maze speed:  $+0.43$
5. Match-stick speed:  $+0.34$
6. Match-stick success:  $+0.33$



HYPOTHESES CONCERNING THE RELATIONSHIPS BETWEEN WAIS SUB-TEST SCORES AND PHYSIQUE AND BETWEEN WAIS SUB-TEST SCORES AND TEMPERAMENT:

At the time of this writing, the available scales for endopenia, mesopenia, ectopenia and their temperamental counterparts are weakened by a rational limitation which prevents them from being used in a definitive way in order to do a thorough check for relationships between sub-test scores and both physique and temperament. Therefore, final statements concerning this part of the study will have to wait until the revised scales for certain physical and temperamental aspects have been correlated with the WAIS data.

However it seems plausible to expect that when the new correlations are available, they will probably be at least as high as the present ones and in the same directions. So the following initial findings from the presently available correlation matrix are offered tentatively:

1. Components of physique have correlated significantly with three WAIS sub-tests at the .05 level or better:

	Partial r with height ruled out
a. PA correlates +.32 with ectomorphy	+ .19
b. BD correlates +.29 with mesopenia	+ .20
c. DS correlates +.33 with ectomorphy	+ .12

As in the case of the correlation between FSIQ and ectomorphy, the influence of height, because of its participation in the score for ectomorphy, seems to be the main physical correlate of high DS scores. The partial r for DS and ectomorphy with height ruled out = +.12. To a lesser degree, this is also the case in regard to PA and BD. A partial r for BD and mesopenia with height ruled out is only +.20. A partial r for PA and

ectomorphy with height ruled out is only +.19.

2. Four sub-tests correlate at the .05 level or better with components of temperament:

	Partial $r$ with height ruled out
a. C correlates +.37 with visceropenia	+ .34
b. D correlates -.30 with visceropenia	- .33
c. DS correlates -.30 with viscerotonia	- .22
d. PA correlates +.36 with cerebrotonia	+ .36

The computation of partial  $r$ 's in order to rule out the influence of height only reduced the correlation between DS and cerebrotonia below the .05 level of significance.

At this point in the analysis of the data, PA is the only WAIS sub-test which manifests both a significant correlation with a dimension of physique and a significant correlation with the corresponding dimension of temperament. There are several other sub-tests which approach these criteria with our presently available scores and which may meet them with the new scores. And again, the problem of a restricted range of somato-type ratings in our population may account for the paucity of significant  $r$ 's in this area.

## CONCLUSIONS

The presently available results of this pilot project should be evaluated within the context of these limitations and cautions:

1. Several of the lumped dimensions which we have used for this analysis contain a weakness inherent in their character as ratios. This has been mentioned earlier in this report. These ratios will be replaced by difference-scores which more nearly approximate linear functions, and which should give more accurate pictures of the inter-relationships between the concepts which these scores represent and our other dimensions.
2. The small number of subjects makes it impractical to check for curvilinearity of relationships.
3. The incomplete and somewhat unrepresentative range of somatotype scores in our sample suggests that with a more normal range of physiques, the obtained relationships could be quite different.
4. The homogeneous character of our sample represents both a strength and a weakness of the study. The latter is the question of the applicability of the findings to the general population.
5. One result of this homogeneity of sample is the generally high verbal intelligence scores of our subjects. Because subjects frequently approached or "hit the ceiling" of these sub-tests, numerous correlations which did not meet the

standard tests of significance might conceivably have done so if the ceilings of the sub-tests had been higher. A subsequent analysis will check for this possibility by using the full ranges of the ETS modification of the WAIS.

6. Although Sheldon's scores have been standardized to a high degree of reliability, it is possible that with modifications in weightings of source data from which the somatotype scores are computed, physical indices which are psychologically more meaningful may be derived. (An illustration of this possibility is the case of ectomorphy which correlates better with cerebrotonia after its high relationship with height is partialled out). For this purpose, both ponderal indices and trunk indices which, along with height, are the main source data for somatotype ratings, will be included in the next analysis.
7. It may well be possible to find learning and perceptual tasks which are more purely representative of affective, conative, or cognitive propensities than the ones used in this study. Nonsense-syllable learning is the most striking failure in this respect.
8. Much can be done to improve the first experimental version of the Boston Scale for Temperament. The results of an independent attempt to devise a self-rating scale will soon be available for this purpose.

With these limitations in mind, a review of the fate of our hypotheses concerning learning and physique shows that two of them, the relationship of finger-maze performance to mesomorphy and the relationship of mirror-drawing errors to

mesomorphy, are acceptable. Only one hypothesis, the relationship between ectopenia and the learning of nonsense syllables, is rejected without any possible alternative explanations. Two hypotheses are rejected, but in each case, a non-hypothesized relationship was established to a statistically significant degree:

1. Eye-blink conditioning did not correlate with endomorphy but did correlate with ectomorphy.
2. Memory-for-Designs did not correlate with ectomorphy but did correlate with endopenia.

One learning task showed a low but suggestive correlation consonant with the hypothesis. This is the relationship between mirror-drawing time and ectomorphy.

Two other hypotheses are rejected, but alternatives which do not achieve significant levels of correlation are suggested by the data:

1. Match-stick test performance does not correlate with ectomorphy but does correlate suggestively with mesomorphy.
2. Incidental learning does not correlate with mesopenia but does correlate negatively with mesomorphy to a suggestive degree.

In the case of our perceptual tasks, the Embedded-Figures Test correlated positively with endomorphy instead of negatively. This significant correlation flew in the face of the hypothesized relationship.

Susceptibility to the Miller-Lyer Illusion correlated with its hypothesized aspect of physique, but not to a significant

degree. Instead, it correlated significantly with endopenia, a related measure.

Of the nine hypotheses concerning the relationships between physique and temperament, three predicted positive correlations and six predicted either no correlations or negative ones. Of the first three, one was supported unequivocally, one was just as clearly rejected, while a third had to be rejected because the correlation closely approached but did not quite attain the .05 level of significance. All six of the hypotheses of nil or negative relationships were accepted.

Our various hypotheses concerning the relationships between intelligence, physique, and temperament were reviewed tentatively. Many suggestive but statistically insignificant relationships were found. Three WAIS sub-tests (PA, BD, and DS) correlated significantly with physique. Four WAIS sub-tests correlated significantly with temperament (C, D, PA, DS). Only PA correlated significantly with both a component of physique and its corresponding component of temperament. The low positive correlation between IQ and linearity (ectomorphy) previously found by both Naccarati and Sheldon was replicated.

A more thorough discussion of the results of this study should await refined statistical analysis. In the meanwhile, it seems apparent that there are significant relationships between physique and psychological functions at several different levels and that the present method of investigating these relationships is worthy of further exploitation.

GLOSSARY

Several "lumped parameters" were devised from the scores for somatotype and for temperament for the purpose of correlating them with the scores on our cognitive and personality measures. Their meanings within Sheldon's system and the ways in which they were devised are listed below:

1. Endopenia ( $\frac{\text{mesomorphy} + \text{ectomorphy}}{\text{endomorphy}}$ ) is the measure of the distance at which a subject stands from the endomorphic extreme. The tendency toward lean, raw-boned muscularity.
2. Mesopenia ( $\frac{\text{endomorphy} + \text{ectomorphy}}{\text{mesomorphy}}$ ) is the measure of the distance at which a person stands from the mesomorphic extreme. The tendency toward weakness and softness of physique.
3. Ectopenia ( $\frac{\text{endomorphy} + \text{mesomorphy}}{\text{ectomorphy}}$ ) is the measure of the distance at which a person stands from the ectomorphic extreme. The tendency toward stocky, well-padded muscularity.
4. Dionysianism ( $\frac{\text{viscerotonia} + \text{somatotonia}}{\text{Cerebrotonia}}$ ) is the measure of the distance at which a person rates himself from the cerebrotonic extreme. The impulsive, expressive, out-going temperament.
5. Prometheanism ( $\frac{\text{somatotonia} + \text{cerebrotonia}}{\text{viscerotonia}}$ ) is the measure of the distance at which a person rates himself from the viscerotonic extreme. The bold, adventuresome, hardy temperament.
6. Christianism ( $\frac{\text{viscerotonia} + \text{cerebrotonia}}{\text{somatotonia}}$ ) is the measure of the distance at which a person rates himself from the somatotonic extreme. The passive, sensitive, self-denying temperament.



7. Visceropenia (endomorph~~y~~ less viscerotonia) is the measure of how greatly a subject's score for endomorph~~y~~ exceeds his self-rating in viscerotonia. Asceticism and the denial of needs for physical security.
8. Somatopenia (mesomorph~~y~~ less somatotonia) is the measure of how greatly a subject's score for mesomorph~~y~~ exceeds his self-rating in somatotonia. Passivity and the denial of assertive propensities.
9. Cerebropenia (ectomorph~~y~~ less cerebrotonia) is the measure of how greatly a subject's score for ectomorph~~y~~ exceeds his self-rating in cerebrotonia. Forced involvement and the denial of introversive needs.
10. Viscerosis (endopenia less Prometheanism) is the measure of how greatly a subject's self-ratings for Prometheanism are exceeded by his endopenia. Sybaritic grasping for pleasure and excitement.
11. Somatorosis (mesopenia less Christianity) is the measure of how greatly a subject's self-ratings for Christianity are exceeded by his mesopenia. Exaggerated aggressiveness and tension to dominate.
12. Corebrosis (ectopenia less Dionysianism) is the measure of how greatly a subject's self-ratings for Dionysianism are exceeded by his ectopenia. Withdrawal into the calm of one's inner life.

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